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International Journal of Infectious Diseases (2005) **9**, 52—59

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Long-term improvement in unsafe injection practices following community intervention

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Received 18 November 2003; received in revised form 19 March 2004; accepted 31 March 2004

Corresponding Editor: Richard Oberhelman, New Orleans, USA

KEYWORDS
Health communication;
Hepatitis C;
Pakistan;
Unsafe injections

Summary

Background: A study in 1994 identified frequent unsafe injections as the cause of widespread hepatitis C virus infection in Hafizabad, Pakistan. A simple low cost community education program was assessed to see if it improved injection safety.
Methods: A local health organization developed educational materials on hepatitis C including advice on how to avoid unnecessary injections and, when injections were necessary, to use a new syringe and needle. Beginning in 1995, this advice was communicated through multiple channels including health education meetings, announcements in mosques, and via pamphlets. In 1998 study workers revisited controls from the 1994 case-control study (along with three of their neighbors of a similar age) to collect information on injection practices in the previous 12 months.
Results: Thirty-three percent of the study's participants in 1998 received $\geq$5 injections in the preceding 12 months compared to 40% of the hepatitis C virus negative controls reported in the year prior to the 1994 study ($p = 0.85$). In 1998 52 persons (34%) brought their own syringe for their most recent injection, a practice that was unreported in 1994. Overall, in 1998 59% of patients received their most recent injection with a new syringe and needle compared to 24% in 1994 ($p = 0.003$).
Conclusions: Following this low cost health communication effort, community members took steps to protect themselves from unsafe injections.
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Introduction

Globally, injections transmit an estimated 21 million hepatitis B infections, 2 million hepatitis C infections and 260,000 human immunodeficiency virus infections each year[1] These infections reflect two

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doi:10.1016/j.ijid.2004.03.007

related problems — injections are both overused and frequently administered unsafely.

In Pakistan widespread unsafe injections are responsible for a national epidemic of hepatitis C virus infections[2–4] and an estimated 42% of acute hepatitis B virus infections.[5] Injections are overused in Pakistan:[6] according to a population-based study in the Sindh province of Pakistan, residents received a mean of 16 injections per person per year (NZ Janjua, personal communication). Among patients presenting with clinical complaints to basic health units in the Sindh province of Pakistan in 1997, 74% received an injection, including 22% of children under the age of one year and 65% of children between one and four years of age.[7]

Injections are popular for several reasons. People commonly believe that injections act faster and are more effective than oral medications.[8–10] Many patients believe that a provider who prescribes an injection is taking their complaint seriously and is concerned about their health and well being. Indeed, patients in Pakistan are willing to pay more to a provider who dispenses an injection than for a non-injection visit.[6] There are few disincentives for unnecessary, unsafe injections. Abscesses from non-sterile injections are relatively rare;[11] blood-borne virus transmission does not generally cause clinical disease until many years later, and so individuals and communities do not connect their serious chronic disease with injections received years earlier.

Injections in Pakistan are frequently unsafe. In one observational study in Pakistan, non-sterile syringes and needles that had been used earlier in the day on other patients were used for 94% of the observed injections.[4] An important determinant of poor injection safety in Pakistan is that safe injections cost more money than re-using contaminated equipment. Thus, practitioners who practise safe injections are at a competitive disadvantage in the marketplace, especially when patients do not understand or value injection safety. A second barrier to injection safety is that the risks of unsafe injections are poorly understood by health care providers in Pakistan,[4] a problem that is compounded by the large proportion of health care practitioners in Pakistan who are neither medically nor scientifically trained.[12]

Hafizabad, Pakistan is a market town with an estimated population of 125,000. It is situated in a fertile agricultural region of the Punjab province in central Pakistan. The Aga Khan Health Service, Pakistan and Aga Khan University conducted a population-based study in Hafizabad in 1993 — 6.5% of Hafizabad residents had antibodies against the hepatitis C virus (HCV).[2] A follow-up case control study in 1994 identified a dose—response relationship between the number of therapeutic injections residents had received in the previous five and ten years, and the prevalence of antibodies to the hepatitis C virus.[2]

The Aga Khan Health Service responded to the study results by developing and implementing a low-cost health education intervention. The objective of the intervention was to reduce unnecessary injections and improve injection safety. Because the 1994 study provided sound community-based data on injection practices prior to the intervention, injection practices were re-evaluated in 1998 to assess the change in practices following the health education program.

Methods

Setting

Volunteers organized by the Aga Khan Health Service manage a community-based primary healthcare program in Hafizabad. Volunteers meet regularly with Hafizabad residents to communicate disease prevention and health promotion advice. The Aga Khan Health Service operates similar community-based primary healthcare programs through 261 healthcare outlets throughout Pakistan. National and province-wide activities of the Aga Khan Health Service are managed by professional staff.

Intervention

Upon learning the results of the hepatitis C studies, the Health Promotion Resource Centre of the Aga Khan Health Service developed health education advice on the risk of unsafe injections. This included developing color booklets and pamphlets on the various types of hepatitis and how to prevent it (Figure 1). Advice included, 'Avoid injections for common ailments such as common cold and cough or fever. In circumstances where it is absolutely necessary to take an injection, ensure that the syringe and needle to be used is new and straight from the wrapping packet.' The Aga Khan Health Service printed several thousands of these booklets and pamphlets in Urdu, the local language, for its program population throughout the country, including approximately 3,500 pamphlets for the program in Hafizabad. Each booklet cost $0.20 and each pamphlet cost $0.025 to print.

Beginning in mid-1995 in Hafizabad, both professional staff (lady health visitors) and volunteers integrated unsafe injection advice into their

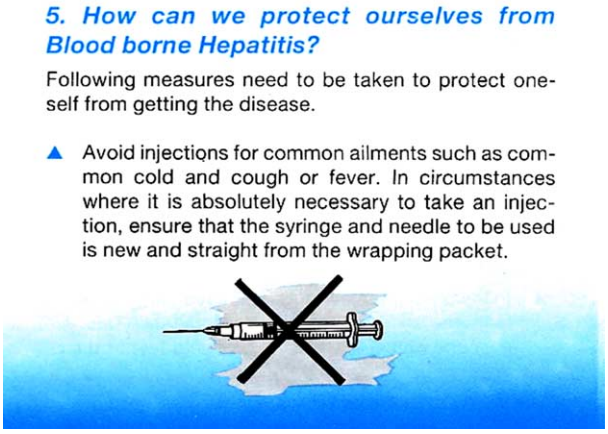

Figure 1 English language version of a section from the Hepatitis brochure encouraging injection safety developed by the Aga Khan Health Services in Pakistan.

ongoing health education activities. These activities included formal health education sessions in groups, informal 'lane meetings' in the community, one-on-one health awareness and counseling sessions, announcements at mosques on the risk of unsafe injections, and the distribution of pamphlets at pharmacies, medical supply stores, the Aga Khan Health Center and door-to-door. They attempted to reach all Hafizabad residents. In addition the Aga Khan Health Service commonly arranged for outside speakers to address health issues for the community including talks on the dangers of unsafe injections and the prevention of HIV/AIDS. These sessions given by outside speakers were open to all, and attendees may not have been aware that they had been arranged by the Aga Khan Health Service. As early as 1992, Pakistan's National AIDS Program developed health education material which noted that HIV could be transmitted through unsafe injections (I Hasan, personal communication).

Prior studies

In December 1993 the Aga Khan Health Service and the Aga Khan University conducted a population-based survey and collected serum on a random sample of Hafizabad residents. These serum samples were tested for antibodies to HCV. In December 1994 the institutions conducted a case-control study to investigate the risk factors leading to infection with HCV. The questionnaire included detailed questions on exposures to injections. Cases were people who were HCV antibody positive in the 1993 sero-survey. Controls were people from the 1993 sero-survey who were HCV antibody negative, and who were frequency matched to cases by age.

1998 enrollment

In July 1998, workers from the Aga Khan Health Service attempted to locate each of the control participants from the 1994 case-control study. Controls were located from the 1994 study because specific data on their injection practices had been collected between January and December 1994 that would be comparable with injection practices between August 1997 and July 1998. The hepatitis C cases from the 1994 study were not located because they only represented a minority of the population (6.5%) that received significantly more injections. To increase power, study workers enrolled three neighbors for each of the located 1994 study participants. Study workers approached the second closest front door and sought residents of similar age who would consent to participate. If the 1994 study control was 4—25 years old, they sought an additional subject ± 3 years. If the original control was 26—40 years, the additional subject was ± 5 years. If the original control was >40 years, the additional subject was ± 10 years. This process of approaching every second household was repeated until three additional persons were enrolled for each 1994 study subject.

Questionnaire

Data were collected regarding the number of injections received in the year prior to the study using the same question in the 1994 and the 1998 study. Interviewers asked how many injections study subjects had received in the preceding year. Responses available were: none, 1, 2—4, 5—9, ≥ 10, and 'don't know'.

Since the 1994 study there was evidence that Hafizabad residents had begun purchasing their own syringes and bringing them to health care practitioners. This behavior was addressed explicitly with a new question in the 1998 study, 'Did you bring your own syringe and needle for your most recent injection?'

In both 1994 and 1998 there was a question regarding the participants' most recent injection, 'Where was the syringe and needle taken from?' The replies were: 'from a closed packet', 'from a bath of boiled water', 'other' (specify), and 'don't know'. It was assumed that if someone had brought their own syringe in 1994, they would have answered either 'from a closed packet' or 'other' and specified that they brought their own syringe.

Statistics

Whether the differences in the proportion of study respondents reporting specific injection

behaviors in 1994 versus 1998 were greater than would be expected by chance was evaluated using McNemar's test for matched analysis. For matched analysis each respondent in 1994 was matched with both their own response in 1998 and to the response of the persons who were age- and neighborhood-matched to them during enrollment in 1998.

Among people in the 1998 study, odds ratios were used to examine the association between various exposures and two outcomes of interest: receiving $\geq$5 injections in the preceding 12 months, and bringing one's own needle and syringe to the last care provider. Confidence intervals were calculated using Cornfield estimates, and the Chi square test was used to measure *p*-values.

Results

The study team enrolled 241 Hafizabad residents in 1998. Sixty-two (26%) had participated in the 1994 study; these 62 represented 93% of the controls from the 1994 study. Respondents were a mean 40.6 years of age (range 14—90); 131 (54%) were female. Ninety-three (39%) had received no formal education. In the preceding three years 38 (16%) were hospitalized, 14 (6%) had an episode of jaundice and four (1.7%) reported hematemesis.

Knowledge

When asked to name a disease that could be transmitted by receiving an injection from a health care practitioner, 57 (24%) mentioned HIV, and 33 (14%) mentioned hepatitis. Forty-four respondents (18%) reported that chronic liver disease, liver cancer or death could result from infection with hepatitis C. When asked to name ways in which hepatitis C could be transmitted, 30 (12%) mentioned receiving injections with an unclean needle. Only 28 (12%) of respondents remembered hearing about hepatitis from the Aga Khan Health Service.

Attitudes

Thirty-four (14%) of respondents reported that if they had a headache they thought it would be safe to get an injection; 21 (9%) thought it would be a good idea to get an injection if they felt a little depressed. Fifty-seven (24%) were willing to pay more for a practitioner who provided an injection rather than oral medication. If an injection or pill were equally effective, 205 of the respondents (85%) preferred a pill.

In the four years preceding the 1998 study, 38 respondents (16%) reported that their family's attitudes towards injections had become less favorable; 14 (6%) reported that their family's attitudes towards injections had become more favorable.

Twenty-six (11%) of respondents in the 1998 study reported that they had refused an injection within the previous three years, nine because they wanted to avoid the pain of the injection, five because they did not believe the injection was needed, and only two because they thought the injection was dangerous.

Practices

Among the 199 respondents who could specify the time of their most recent injection, their most recent injection was a median of four months preceding the survey (range one day to eight years). Among the 152 persons who received an injection in the preceding year, 129 (85%) received their most recent injection from a private general practitioner who may or may not have been a qualified physician.

Only 63 persons (26%) reported receiving no injections in the preceding year. Respondents received a median of 2—4 injections in the preceding year, the same median number of injections as in 1994. Among respondents who could specify the number of injections they received, 33% of study participants in 1998 received $\geq$5 injections in the preceding 12 months compared to 40% of the hepatitis C virus negative controls reported in the year prior to the 1994 study (McNemar's test $p = 0.85$). Indeed, the distribution of the number of injections received in the preceding year was quite similar in 1998 and 1994 (Table 1). Among 1998 study participants there was also little difference in the number of injections received by those who had participated in the 1994 study compared to those who only participated in the 1998 evaluation (Table 1).

In 1994, among the 46 HCV-negative controls who reported receiving at least one injection in the preceding year, none reported bringing their own syringe to their most recent injection and 11 (24%) reported that the syringe and needle used to inject them was opened from a new package. In 1998, of the 152 persons who received an injection in the previous year, 52 persons (34%) brought their own syringe for their most recent injection; 37 (24%) reported that the care provider opened a package with a new syringe and new needle in front of them. Thus, in 1998, 59% of patients received their most recent injection with a new syringe and needle compared to 24% in 1994 (McNemar's test $p = 0.003$).

Table 1 Injection frequency in 1994 versus 1998: Hafizabad, Pakistan.

1994		1998		
Injections per year	No. (%) of hepatitis C negative controls 1994	No. (%) of 1998 study population	No. (%) of 1998 study population who also participated in 1994 study	No. (%) of 1998 study population who were new enrollees in 1998
0	17 (25)	63 (26)	13 (21)	50 (28)
1	6 (9)	18 (7)	5 (8)	13 (7)
2—4	15 (22)	62 (26)	13 (21)	49 (27)
5—9	10 (15)	32 (13)	10 (16)	22 (12)
≥10	15 (22)	40 (17)	10 (16)	30 (17)
Don't know	4 (6)	26 (11)	11 (18)	15 (8)
Total	67	241	62	179

Associations with safer injection behavior

Compared to persons who received <5 injections in the year preceding the 1998 survey, persons who received ≥5 injections were 2.3 times more likely to be illiterate (51% vs. 31%; OR = 2.3; 95% CI 1.3, 4.1) and 2.6 times more likely to recall receiving health information from the Aga Khan Health Service (21% vs. 9%, OR = 2.6; 95% CI 1.1, 6.4). Age over 40 years, female sex, participation in the 1994 study and specific knowledge about the risk of blood-borne pathogen transmission from injections were not significantly associated with receiving fewer injections (Table 2).

Among respondents who reported an injection in the preceding year, those who recalled hearing any health advice from the Aga Khan Health Service, and those who knew that injections could transmit hepatitis or HIV were more likely to have brought their own syringe and needle to their most recent injection (Table 3). There was a statistical interaction between literacy and the effect of recalling exposure to the Aga Khan Health Service advice. Among persons who were not literate, those who recalled hearing educational advice were no more likely to bring their own syringe and needle to their most recent injection than illiterate persons who did not recall hearing the advice (13% vs. 11%, OR = 1.2; 95% CI 0.1, 8.3; $p = 0.86$). However, among persons who were literate, those who recalled hearing educational advice from the Aga Khan Health Service were more likely to bring their own syringe and needle to their most recent injection than literate persons who did not recall hearing the advice (28% vs. 11%, OR = 3.1; 95% CI 0.9, 11.0; $p = 0.04$).

Discussion

Injection practices changed in Hafizabad, Pakistan between 1994 and 1998. Hafizabad residents received approximately the same number of injections, but the proportion of injections administered with a new syringe increased from 24% to 59%. This was due to a new practice, Hafizabad residents purchasing a new syringe prior to visiting a health practitioner.

This improvement in injection practices followed a simple health education program outlining the risks of unsafe injections and discouraging unnecessary injections. It is unclear how much of the change in injection practices was as a direct result of the health education program. In favor of attributing the changes to the health education program, observers in Hafizabad reported that the Aga Khan Health Services was the major source of information on unsafe injections between 1994 and 1998 in these communities. Indeed, no other group was encouraging injection safety in Hafizabad until Pakistan's National AIDS Program public service announcements recommended avoiding unsafe injections as part of HIV/AIDS prevention in the autumn of 1998, but this was after this assessment was completed.

There is also evidence against attributing the change in practices solely to the health education program. First, the earlier studies of hepatitis in Hafizabad may have sensitized the community to their vulnerability to injection-borne viruses and increased their motivation to adopt safer practices. Second, only a minority of persons who reported bringing a new syringe to their health care provider recalled receiving any health advice from the Aga Khan Health Service, and only 50% could identify that unsafe injections could transmit hepatitis virus or HIV. However, much of the health education initiated by the Aga Khan Health Service was communicated through informal meetings, from mosques, and through bringing in speakers from outside organizations. Thus, many respondents may not have identified information they received with the Aga Khan Health Service. Without a contemporaneous control group that received no interven-

Table 2 High frequency of injection use by selected characteristics, 1997–1998: Hafizabad, Pakistan.

Participants' characteristics	No. (%) of persons who received ≥5 injections in the last year (n = 72)	No. (%) of persons who received <5 injections in the last year (n = 143[a])	Odds ratio	95% CI[b]	P-value
Age >40 years	34 (47)	60 (42)	1.2	0.7, 2.3	0.46
Illiteracy	37 (51)	45 (31)	2.3	1.2, 4.3	0.004
Female	45 (63)	75 (52)	1.5	0.8, 2.8	0.16
1994 study participant	20 (28)	31 (22)	1.4	0.7, 2.8	0.32
Recalled receiving AKHS[c] health information	15 (21)	13 (9)	2.6	1.1, 6.4	0.02
Knew injections could transmit hepatitis or HIV	24 (33)	60 (42)	0.7	0.4, 1.3	0.22
Knew HCV can be transmitted via injections	8 (11)	20 (14)	0.8	0.3, 2.0	0.55

[a] Includes the 63 persons who reported 0 injections in the preceding year.
[b] Cornfield estimates of the confidence interval.
[c] The Aga Khan Health Service.

Table 3 Association of selected characteristics with bringing own syringe and needle to a care provider among persons who received an injection in the year prior to interview (1997/1998).

Participants' characteristics	No. (%) of persons whose most recent injection was with a syringe they brought to the care provider (n = 52)	No. (%) of persons whose most recent injection was with a care provider's syringe (n = 100)	Odds ratio	95% CI[a]	P-value
Age > 40 years	24 (46)	42 (42)	1.2	0.6, 2.5	0.62
Illiteracy	16 (31)	46 (46)	0.5	0.2, 1.1	0.07
Female	26 (50)	56 (56)	0.8	0.4, 1.6	0.48
1994 study participant	17 (33)	21 (21)	1.8	0.8, 4.2	0.11
Recalled receiving AKHS[b] health information	12 (23)	11 (11)	2.4	0.9, 6.6	0.05
Knew injections could transmit hepatitis or HIV	26 (50)	33 (33)	2.0	1.0, 4.3	0.04
Knew HCV can be transmitted via injections	9 (17)	13 (13)	1.4	0.5, 3.9	0.47

[a] Cornfield estimates of the confidence interval.
[b] Aga Khan Health Service.

tion for comparison, how much of the improvement in injection practices is directly attributable to the Aga Khan Health Service health education effort is uncertain.

These data also illustrate the difficulty in reducing the frequency of therapeutic injections. People value the healing ritual that includes an injection.[8] Switching to a new syringe and needle, but continuing to receive frequent injections requires fewer changes in beliefs, values and behavior than simply seeking fewer injections. Reducing unnecessary injections remains an important public health goal. It not only reduces transmission of blood-borne pathogens, but also reduces hazardous waste and improves economic efficiency of the health sector. Thus, broader efforts to reduce injections should be undertaken and evaluated, but immediate focused efforts to improve injection safety are likely to work more quickly.

The marginal cost of adding safe injection messages into the Aga Khan Health Service in Hafizabad was less than $500. There are three reasons this cost was so low. First, there was already a primary health care system in place which was regularly disseminating health education advice. Second, the cost of developing and printing health education materials was divided over a large network. Third, the communication methods used by the Aga Khan Health Service — booklets, pamphlets, awareness programs organized by volunteers, discussions in mosques and formal health education sessions by professionals — are much less costly than mass media.

In Hafizabad the health education messages were quite abstract. They outlined the risk of unsafe injections; they were not the simple repetitive behavioral prescriptions which have effectively changed health-related behavior in other settings.[13] Not surprisingly, it was the Hafizabad residents who were better educated and who recalled hearing the health advice who were most likely to bring their own new clean needle and syringe to their most recent visit. By explaining the problem to the community, the Aga Khan Health Service empowered the community to solve their problem. It is still not known whether this approach to the problem of accepting unsafe injections will diffuse to less educated members of the community, and whether there are affordable ways to facilitate its diffusion.

There are important limitations to this assessment. The questionnaire used in 1994 did not include a specific question on whether or not people brought their own syringe. When asked where the syringe came from in 1994, respondents had the option of saying it came from a closed packet. The 1994 questionnaire did not distinguish whether the closed packet was provided by the practitioner or by the patient. The question on bringing one's own syringe in 1998 was added because of specific reports that this was a new practice since the 1994 study. Thus, while there was some difference in the way these questions were asked, the reported differences are likely to reflect differences in behavior.

A further limitation is that the control group that was the basis of the 1994 comparison was known to be HCV negative. HCV negative persons had fewer injections than HCV infected persons. If the HCV infected persons are included, it suggests more of a decline in injection use. However, since HCV infected persons represented 18% of the persons in the 1994 case control study, but only 6.5% of the general population, their inclusion would be expected to over-represent the population's experience of injections. Thus, the underestimate in the number of injections received in 1994 was slight.

Following this low cost intervention that focused only on educating the community, injection safety improved. More elaborate interventions which have focused on changing healthcare provider behavior,[14,15] improving the regulatory framework and availability of injection supplies,[16] or combined interventions to both community and providers[17] have also improved injection safety. Continued efforts to develop more effective and affordable interventions would be useful. However, in view of the fact that over 25 million new viral blood-borne infections occur from unsafe injections each year, public health organizations should intervene immediately with available methods to reduce unsafe injections, including adding safe injection advice to current health education activities.

Acknowledgements

The authors thank Robert M. Hoekstra for his review of the statistical methodology and interpretation.

Conflict of interest: No conflict of interest declared.

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